

Protein synthesis

Question Paper 3

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Nucleic acids and protein synthesis
Sub Topic	Protein synthesis
Booklet	Theory
Paper Type	Question Paper 3

Time Allowed : 66 minutes

Score : / 55


Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

- 1 (a) Bacteria in root nodules of leguminous plants carry out nitrogen fixation.

Describe how nitrogen that is available to these bacteria can eventually become part of animal protein.



[5]

- (b)** Fig. 2.1 shows the base sequence of a DNA triplet code used to produce mRNA. Fill in the corresponding tRNA anticodon in the space provided.

DNA triplet	T A C
tRNA anticodon	

[1]

Fig. 2.1

- (c)** More mRNA molecules than tRNA molecules are synthesised in cells.

Suggest a reason for this.

..... [1]



[Total: 10]

- 2 (a) Explain what is meant by a **gene** mutation and outline the possible consequences of a gene mutation for an organism. [9]
- (b) Explain how faulty CFTR proteins in cell surface membranes can lead to the symptoms of cystic fibrosis. [6]

[Total: 15]



- 3 (a) State the structural features of DNA that make it a stable molecule.

.....

.....

.....

.....

..... [2]

- (b) DNA has been described as a 'carrier of coded information'.

Explain this statement.

.....

.....

.....

.....

..... [2]

- (c) State when, during a cell cycle, DNA replication occurs.

..... [1]

- (d) There are two alleles of the gene for the β -haemoglobin polypeptide:

- HbA (normal)
- HbS (sickle cell).

Describe **and** explain the difference between the HbA and HbS alleles of this gene.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(e) DNA polymerase is an enzyme involved in the replication of DNA.

One of the substrates required by DNA polymerase is ATP.

ara-ATP is a chemical that affects DNA polymerase activity.

In an investigation, the effect of different concentrations of ATP on the rate of DNA synthesis was determined:

- with no ara-ATP
- with a low concentration of ara-ATP
- with a high concentration of ara-ATP.

The results of the investigation are shown in Fig. 5.1.

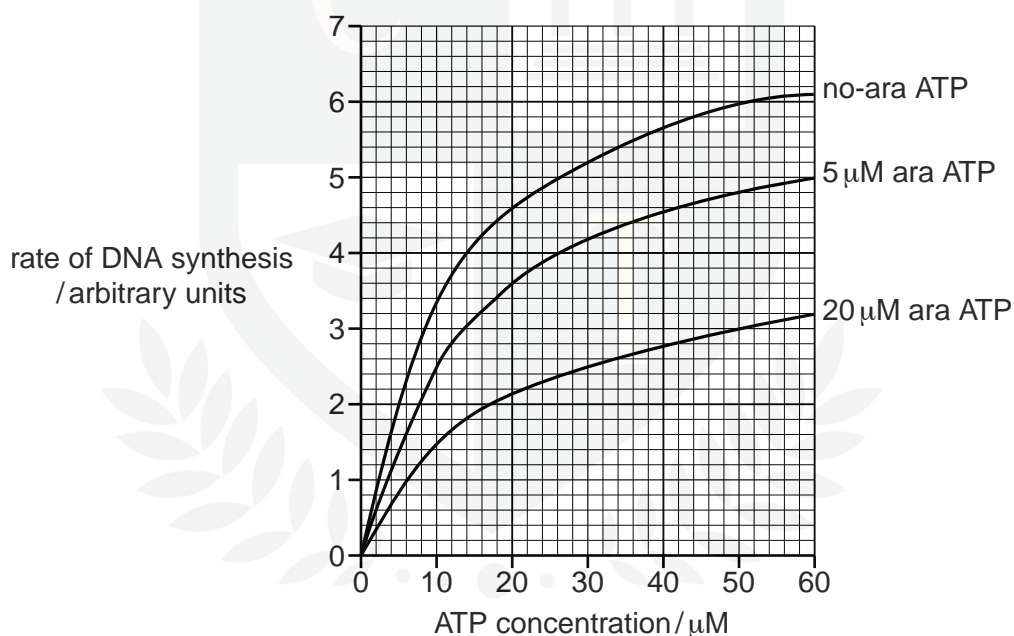


Fig. 5.1

Explain, in terms of the mode of action of enzymes, the results of the investigation shown in Fig. 5.1.

.....


.....

.....

.....

.....

.....



[4]

Diagram illustrating the sequence of a polypeptide chain being synthesized. The sequence is CCGUAAGAU. The sequence is divided into three codons: CCG, UAA, and GAU. The codon number is 1, 2, and 3. An arrow indicates the direction of polypeptide synthesis from left to right.

Fig. 5.1

(i) the tRNA anticodon complementary to **codon 1**
..... [1]

(ii) the DNA sequence which coded for **codon 3**.
..... [1]

Explain the consequence of a mutation which deletes the **U** from **codon 2**.

[3]



CHEMISTRY ONLINE
— TUITION —

- 5 Fig. 3.1 is a photomicrograph of a transverse section through a leaf from a tea plant, *Camellia sinensis*.

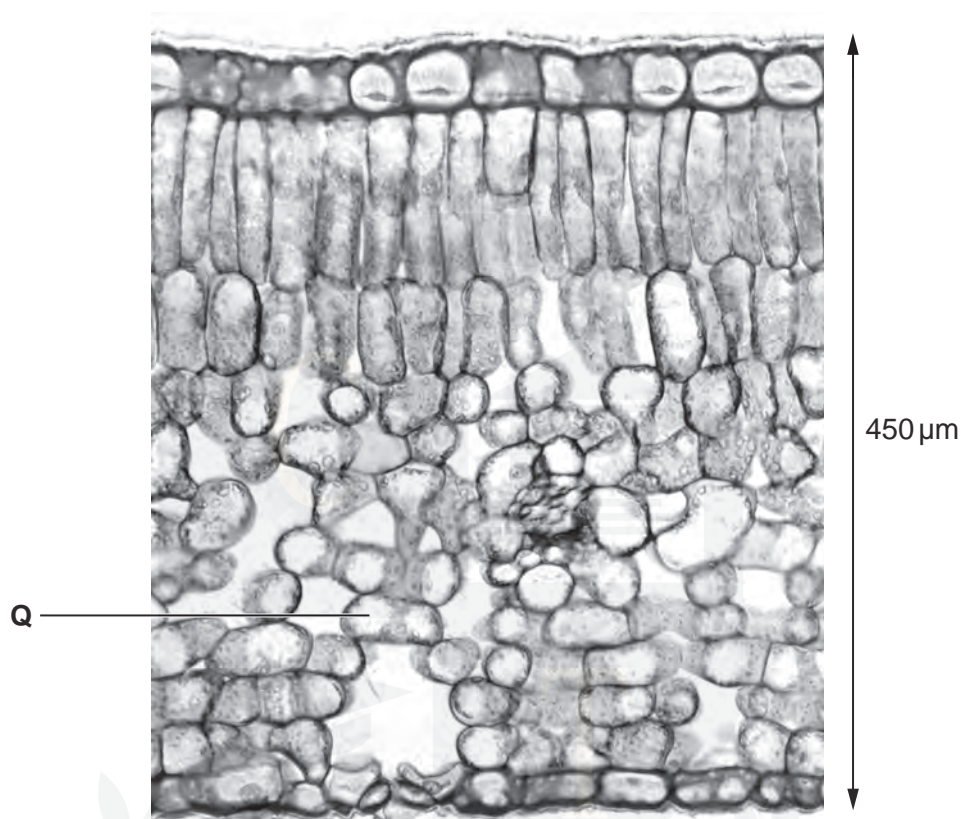


Fig. 3.1

(a) Use label lines and the letters **X**, **Y** and **Z** to label the following features on Fig. 3.1.

X a cell of the upper epidermis

Y a palisade mesophyll cell

Z a guard cell

[3]

- (b) Describe **and** explain how water moves from inside the leaf at point **Q** on Fig. 3.1 to the atmosphere outside the leaf during transpiration.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

- (c) The leaf of *C. sinensis*, shown in Fig. 3.1, has developed in a sunny position.

State three features of the leaf, **visible in Fig. 3.1**, which show that it has developed in a sunny position.

1.

.....

2.

.....

3.

.....

..... [3]

[Total: 10]